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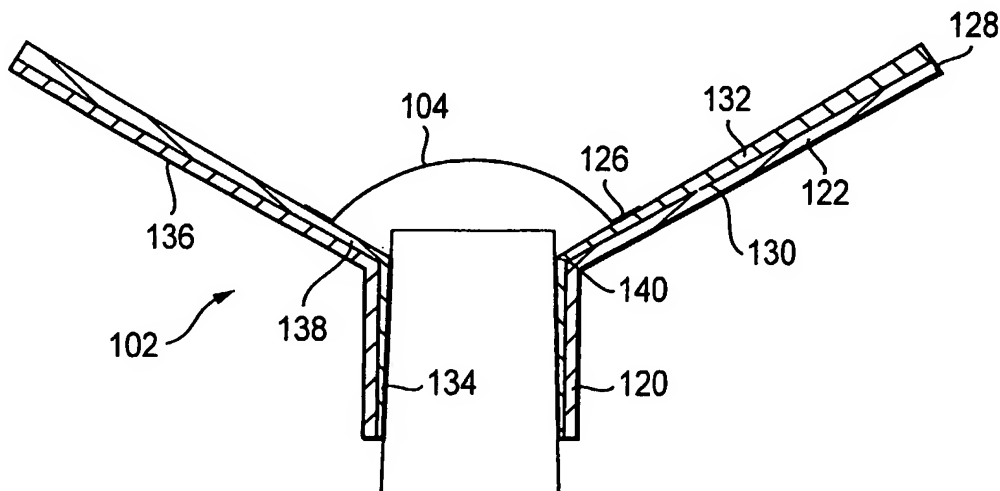
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(54) Title: MULTILAYER LOUDSPEAKER DIAPHRAGM



(57) Abstract: A loudspeaker diaphragm includes a continuous coating on at least one surface of the diaphragm. The continuous coating may be non-uniform and may taper from a maximum in value in one region of the diaphragm to a minimum value in another region of the diaphragm. The coating is formed in a single coating step without the need for use of a contact mask or interruption of the process to change process parameters. The tapered coating is formed by controlling the current density distribution within an electrochemical cell such that the rate of formation of the coating tapers from a first value in one region of the diaphragm to a second value in another region of the diaphragm.

WO 2004/006623 A3

W 2004/006623 A3



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/07189

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04R31/00 H04R7/02 C25D11/02 C25D9/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04R C25D B01J C04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 38 31 376 A (KELLER FILIP) 22 March 1990 (1990-03-22)	1,2, 7-21,24, 26-30, 32-37
Y	column 4, line 52 -column 5, line 34; figures 1-7	3-5,22, 23
X	GB 369 992 A (ERNST OSCAR PERSSON) 21 March 1932 (1932-03-21)	1,2,7, 15,16, 18,19
Y	page 2, line 84-121; figure 4	3-5,22, 23
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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G document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 011, no. 104 (E-494), 2 April 1987 (1987-04-02) & JP 61 251298 A (PIONEER ELECTRONIC CORP), 8 November 1986 (1986-11-08) abstract	3-5, 22, 23
A	DE 902 260 C (EBERHARD VOLLMER) 21 January 1954 (1954-01-21) the whole document	1, 15, 26, 34
X	PATENT ABSTRACTS OF JAPAN vol. 004, no. 107 (P-021), 31 July 1980 (1980-07-31) -& JP 55 064602 A (NIPPON COLUMBIA CO LTD), 15 May 1980 (1980-05-15) abstract; figures 5,6 -& DATABASE WPI Section Ch, Week 198026 Derwent Publications Ltd., London, GB; Class A85, AN 1980-45615C XP002276924 & JP 55 064602 A (NIPPON COLUMBIA CO LTD), 15 May 1980 (1980-05-15) abstract	38, 40, 41, 61-71, 73, 77, 79-87, 100, 103-106
Y		42-49, 59, 60, 72, 74-76, 78, 97-99, 101, 102
Y	GB 255 736 A (EDGAR BAUER; WMF WUERTTEMBERG METALLWAREN) 29 July 1926 (1926-07-29) the whole document	42-49, 59, 60, 72, 74-76, 78, 97-99, 101, 102
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 403 (E-674), 26 October 1988 (1988-10-26) & JP 63 143000 A (FOSTER DENKI KK), 15 June 1988 (1988-06-15) abstract	6, 25, 31, 39, 50-58, 88-99

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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 03/07189

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 327 372 B1 (DEVANTIER ALLAN O ET AL) 4 December 2001 (2001-12-04) column 4, line 29 - line 47; claims 9,12; figure 5	6,25,31, 39, 50-58, 88-99
P,X	US 2002/184964 A1 (PEARSALL THOMAS J ET AL) 12 December 2002 (2002-12-12) paragraph '0023! - paragraph '0037!; figures 2,3	38,40, 41, 61-71, 73,77, 79-87, 100, 103-106
Y		42-49, 59,60, 72, 74-76, 78, 97-99, 101,102

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 03/07189

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-5, 7-24, 26-30 and 32-37

Independent apparatus claims 1, 15, 26 and 34 relate inter alia to a loudspeaker diaphragm comprising a tapered coating.

1.1. Claims: 2-5 and 22-24

According to claims 2 and 27 the coating continuous (see also claim 15)

Claims 3 and 22 and claims 4 and 23 further specify the materials for the diaphragm and the coating, respectively.

1.2. Claim : 7 and 8

Claims 7 and 8 further specify the shape of the diaphragm.

1.3. Claims: 9-14, 16-21, 28-30, 32, 33 and 35-37

Claims 9-14, 16-21, 28-30, 32, 33 and 35-37 further specify the shape of the coating.

2. Claims: 6, 25, 31 and 38-106

Independent claims 38 and 100 relate inter alia to a method of forming a tapered coating on a metal substrate by anodizing.

Independent claim 73 relates inter alia to a method of forming a tapered oxide coating on a metal substrate by anodizing.

Independent claim 89 relates inter alia to a method of forming a tapered oxide coating on a loudspeaker diaphragm by anodizing.

Dependent apparatus claims 6, 25 and 31, which depend on claims 1,15 and 26, respectively, further specify that the coating is an anodically formed oxide layer.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/07189

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